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Industrial Commission of
Ohio.

Standards for safety and
sanitation relating to steel..

Columbus

1916

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THE INDUSTRIAL COMMISSION
OF OHIO

DEPARTMENT OF
WORKSHOPS AND FACTORIES

Standards for Safety and
Sanitation Relating
to Steel Mills



MEMBERS OF THE INDUSTRIAL COMMISSION OF OHIO

WALLACE D. YAPLE, *Chairman*
Chillicothe

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Chief Factory Inspector

VICTOR T. NOONAN,
Safety Director

THE INDUSTRIAL COMMISSION
OF OHIO

DEPARTMENT OF
WORKSHOPS AND FACTORIES

Standards for Safety and Sanitation
Relating to Steel Mills

Adopted by The Industrial Commission
of Ohio and Recommended to
Employers as Standards of
Safety and Sanitation



COLUMBUS, OHIO:
THE F. J. HEER PRINTING CO.
1916

Bound at the State Bindery.

GENERAL SAFETY ADVISORY COMMITTEE.

Mr. S. P. Bush...President, The Buckeye Steel Castings Company, Columbus, Ohio
 Mr. R. H. Jeffrey.....The Jeffrey Manufacturing Company, Columbus, Ohio
 Mr. D. R. Kennedy.....Youngstown Sheet & Tube Company, Youngstown, Ohio
 Mr. F. M. Baggs.....Portsmouth, Ohio
 Mr. Malcolm Jennings....Sec'y of the Ohio Manufacturers' Ass'n, Columbus, Ohio
 Mr. L. H. Burnett.....Carnegie Steel Company, Pittsburg, Pa.
 Mr. Samuel G. McMeen....President, Columbus Railway, P. & L. Co., Columbus, O.
 Mr. W. E. Wells.....East Liverpool, Ohio
 Mr. John Voll.....President, Ohio Federation of Labor, Zanesville, Ohio
 Mr. Victor T. Noonan, Director of Safety, Industrial Commission of Ohio,
Secretary

This general advisory committee by unanimous vote recommends that this report of the sub-committee on steel regulations be recommended to The Industrial Commission of Ohio for enforcement on and after January 1, 1916, unless later action is taken by the advisory committee, and that in the meantime, these rules be printed and sent out to the steel mills and to others interested, with the statement that these rules have been adopted by the advisory committee and recommended to The Industrial Commission of Ohio.

COMMITTEE ON STEEL MILLS.

Mr. L. H. Burnett, chairman.....Carnegie Steel Co., Pittsburg, Pa.
 Mr. Geo. M. Verity, Pres. (Represented by C. R. Hook, Vice-President....
American Rolling Mill Co., Middletown, Ohio
 Mr. Ed. McLean.....1360 Grandview Avenue, Youngstown, Ohio (Labor)
 Mr. Abraham Garfield.....140 East Chalmers Avenue, Youngstown, Ohio (Labor)

RESOLUTION.

Be it Resolved, That the recommendations of the Advisory Committee upon Safety and Sanitation regulation of steel mills shall be accepted by the Commission as standards for inspection; that inspectors shall be instructed to report any divergence from such standard in such shops and factories, and that such divergence shall be remedied upon orders of the Commission; and that such orders shall have the force and effect of law.

That the employers operating such shops, factories and operations shall be requested to bring their plants and operations into accord with said standards in advance of said inspection.

THE INDUSTRIAL COMMISSION OF OHIO,

By WALLACE D. YAPLE,
Chairman.

Adopted June 30, 1916.

Attest:
 GEO. L. STOUGHTON,
Secretary.

STEEL REGULATIONS.

Industrial Commission of Ohio.

SAFETY STANDARDS FOR BY-PRODUCT COKE OVENS.

- (1) Hoppers should be guarded in such a manner as to prevent man from falling.
- (2) Exposed moving parts of coal and coke handling machinery to be guarded as prescribed by general code. (It is recommended that grease cups be extended to the outside of the guards to facilitate oiling.)
- (3) Some method of shutting off power to be installed near coal hoppers to enable workmen to shut down hopper shakers in case of accident.
- (4) All approaches leading to rooms or buildings where coal dust or gas may accumulate to bear warning signs forbidding smoking or open lights.
- (5) All elevated walks, stairways and platforms to be guarded by standard railing. (Note exception under Rule 6.)

(Would recommend that "standard railing" be specified as follows: To be not less than $3\frac{1}{2}$ ft. in height, with intermediate rail midway between top rail and floor, and shall have toe-board or toe-plate at base at least 3" in height.)

- (6) Exception to Rule 5 to be made for platforms at both front and back of coke ovens.
- (7) Quenching cars and larry cars to be equipped with automatic warning signals.
- (8) All power transmission machinery to be guarded by standard guards.
- (9) Reversing machines and counter-weights on oven platforms should be enclosed by solid or mesh guards.

CODE OF SAFETY STANDARDS FOR BLAST FURNACES, DOCKS, ORE STORAGE YARDS, AND OTHER EQUIPMENT PERTAINING TO THE MANUFACTURE OF PIG IRON.

SECTION A.—GENERAL:

- (1) These rules are intended to cover the fundamental safety requirements for blast furnaces, cast houses, stoves, gas cleaning apparatus, skip hoists, pig casting machines, stock houses and stock handling machinery.
- (2) Valves, switches and operating levers that control the movement of machinery covered by this code shall be provided with devices which will permit them to be locked.

- (3) Standard platforms, provided with permanent stairways or iron ladders, shall be installed at all elevated points where employees daily or frequently are required to go. This rule shall not apply to railroad structures.
- (4) Some means for the quick resuscitation of men overcome by gas shall be provided at the blast furnaces.
- (5) A signal system shall be maintained between each blast furnace and its blowing engine room.

SECTION B.—BLAST FURNACES:

- (1) Each blast furnace shall be equipped with a telephone or speaking tube connecting the top of the furnace with the cast house or blower's office. It is also advisable to have a means of quick communication between the cast house or blower's office and skip hoist operator's house.
- (2) A removable shield constructed with a hole for the movement of the drill shall be provided when tapping the iron hole.
- (3) The mud gun shall be equipped with a funnel shaped guard at least 6" high around the receiving hole of the mud cylinder.
- (4) For all new construction, explosion doors on top of the furnace shall be of the bleeder type only, and so constructed to prevent, as far as possible, the escape of anything but gas and fine material.
- (5) Platforms shall be provided for all bleeder valves, and wherever practicable such platforms shall be standard.
- (6) Bustle pipes shall have a railed walk with toe boards and shall be equipped with stationary stairs or steel ladders.
- (7) Provision shall be made to protect persons underneath the skip car tracks from falling material.

SECTION C.—STOVES:

- (1) Means shall be provided so that before men are permitted to enter stoves for any purpose, the cold blast and gas burner valves must be locked shut, the chimney valve locked in proper position and the operating mechanism to the hot blast valve disconnected or locked.
- (2) All manholes at or about the top of each stove shall be provided with platforms accessible by stairways or permanent ladders.

SECTION D.—CAST HOUSES:

- (1) Casting holes where ladles are loaded under the floors, shall be railed, or where this is not practicable, a grating shall be provided.

- (2) Two or more exits from opposite sides or ends of cast houses shall be provided by runways or stairs. Where the cast house floor is elevated permanent or removable railings (not necessarily standard) shall be provided.
- (3) All permanent gates in iron and cinder runners shall be operated from a distance.
- (4) All men in cast house crews shall wear eye protectors. Men operating or walking about acetylene, electric or oxygen burning apparatus must wear colored eye protectors.

SECTION E.—GAS CLEANERS:

- (1) All gas cleaners which may have to be entered while the furnace is in operation shall be provided with one or more valves by which then entering gas can be shut off.
- (2) Operating devices for dust catchers shall be arranged to enable the employees to dump them at such a distance and in such a location as to avoid the probability of being burned by hot dust.

SECTION F.—STOCK HOUSES:

- (1) Scale cars and transfer cars shall be equipped with fenders or wheel guards, and warning signals.

SECTION G.—PIG CASTING MACHINES:

- (1) Shields or shelter houses must be provided for protection of the men at the pouring end of pig casting machines.
- (2) All men at pig casting machines shall wear eye protectors during the pouring.

SECTION H.—RELINING PRECAUTIONS:

- (1) For relining purposes, hooks on brick hoisting lines shall be designed so that in case of fouling, the hook will not be disengaged. The well through which material is hoisted to the working scaffold should be so constructed as to prevent the probability of the bucket fouling, and provided with a toe board around the opening of each platform.

SECTION I.—ORE STORAGE YARDS:

- (1) Any live conductor bar or trolley wires, not a part of a machine, and so situated as to be touched by a person on the ground or permanent passageway, should be protected as far as practicable.
- (2) Track fenders or wheel guards shall be installed on all traveling ore handling machinery, except steam shovels, locomotive cranes, and other standard railroad equipment.

SECTION J. — DOCKS:

- (1) Life preservers and pike poles shall be maintained in conspicuous and easily accessible places on all water front docks.
- (2) Snubbing posts shall, as far as practicable, be of a type that will lessen the probability of the lines slipping off.

CODE OF SAFETY STANDARDS FOR THE BESSEMER DEPARTMENT OF STEEL PLANTS.

These rules are intended to cover the fundamental safety requirements for Bessemer Converters, Hot Metal Mixers, Cupolas, Strippers and other equipment pertaining to the manufacture of Bessemer Steel.

SECTION A. — GENERAL:

- (1) Valves, switches, and operating levers that control the movement of machinery covered by this code shall be provided with devices which will permit them to be locked.
- (2) Standard platforms provided with permanent stairways or iron ladders shall be installed at all elevated points where employees daily or frequently are required to go. This rule does not apply to railroad structures.
- (3) All men engaged in the pouring or handling of molten metal or molten slag shall wear eye protectors.
- (4) Pouring platforms and other places where men are endangered from molten metal shall be provided with at least two exits.

SECTION B. — HOT METAL MIXERS:

- (1) All mixers shall be equipped with counter balances or an automatic mechanical device which will either return the mixer to an upright position or prevent it from upsetting in case the power is off the tipping mechanism.
- (2) All mixers operated by hydraulic power shall be equipped with an emergency valve, so arranged that if the main operating valve fails while the mixer is pouring, the emergency valve can be operated immediately, to prevent the mixer from upsetting or to return it to an upright position.
- (3) A warning signal shall be installed on each mixer to be sounded when the mixer is about to be poured.
- (4) Automatic rail stops shall be placed on either side of the opening of hydraulic hoists used for conveying iron to mixers, and the opening in the floor caused by the raising of the hoist shall be guarded by automatic gates.

- (5) Auxiliary hoists on ladle cranes shall be equipped with a type of hook which can be attached by the craneman to tip the ladle after the ladle has been hoisted to pouring position.
- (6) There shall be a signal system between the mixer operator and the operator of the transfer ladle to notify the operator when the pouring is finished and the ladle is ready to be moved.
- (7) All cages on hot metal cranes shall be arranged to give protection to the craneman in case of spilling or dropping a ladle of hot metal. The methods recommended are either to provide escape platforms on the outside of the building, which will be accessible from the crane cage, or to provide an enclosed fire-proof cage. Where an auxiliary enclosed fire-proof cage is installed for emergency purposes, it should be equipped with an auxiliary control for the bridge travel to allow the craneman to move the crane away from the immediate place of danger.

SECTION C. — CUPOLAS:

- (1) Cupolas shall be covered at charging floor level where men are working in cupolas, to prevent chargers from throwing in material, or material falling from stack onto men. These covers are to be constructed so as to allow ventilation to men working in cupolas.
- (2) Provision shall be made to cover openings between cupola shell and charging floor.
- (3) Drop chutes shall be enclosed as nearly as practicable. Preferably props shall be pulled by snatch block and cable, rather than by hand. Warning shall be given before bottoms are dropped.
- (4) When cupola cinder passes through hole in the floor, this hole shall be guarded by a suitable shield or railing.

SECTION D. — LADLES:

- (1) All ladles shall be bottom heavy, and ladle cars shall be equipped with safety devices to prevent ladle tipping.
- (2) Iron transfer ladles shall be provided with a warning signal.

SECTION E. — VESSELS:

- (1) A signal shall be provided to give warning whenever a vessel is to be turned up or down.
- (2) A signal system operated from the scrap-charging floor shall be installed to give warning when the vessel is about to be charged with scrap. Signal shall also be sounded when the charging of scrap is finished.

- (3) The hydraulic mechanism, operating the vessels shall be equipped with an emergency valve so arranged that if the main operating valve fails while the vessel is pouring, the emergency valve can be operated immediately to control the movement of the vessel.
- (4) Vessels shall not be blown into stacks.

SECTION F. — HANDLING MOLTEN METAL:

- (1) Hydraulic pouring cranes shall be equipped with safety automatic devices that will hold the crane jib and ladle suspended in pouring position if the pressure should fail.
- (2) The uncapping stand shall be equipped with a barrier to provide cooling of the ingots before they are uncapped.
- (3) Ingot mould cars shall be equipped with coupling devices designed so that it will not be necessary under ordinary conditions for men to stand between the cars to couple.

SECTION G. — BOTTOM HOUSE:

- (1) A mechanical means shall be provided for removing material from dry and wet mixers while they are in motion.

SAFETY STANDARDS APPLYING TO OPEN HEARTH, CRUCIBLE, AND ELECTRIC FURNACE PRACTICE.

OPEN HEARTH.

Furnace floor and pit.

- (1) Tapping platforms, charging floors and other elevated points should be guarded by standard rails with the exception of pouring platforms.
- (2) The opening in railing at tapping platform for spouts or runners to be provided with a suitable removable guard to protect same when not in use.
- (3) Charging machines must be provided with warning signals.
- (4) When tearing out a furnace beneath the floor a tight boarding must be built around the furnace to prevent material from falling on workmen below. This should apply when a furnace is to be completely torn out and the uptakes and division walls removed, otherwise a floor in the uptake is sufficient.
- (5) Provision shall be made such that when a furnace is down for repairs the gas can not be accidentally turned into the furnace.
- (6) All cages on hot metal cranes shall be arranged to give protection to the cranimen in case of spilling or dropping a ladle of hot metal. The methods recommended are either to pro-

vide escape platforms on the outside of the building, which will be accessible from the crane cage, or to provide an enclosed fire-proof cage. Where an auxiliary enclosed fire-proof cage is installed for emergency purposes, it should be equipped with an auxiliary control for the bridge travel to allow the craniman to move the crane away from the immediate place of danger.

- (7) In new construction, charging buggies shall be equipped with coupling devices designed so that it will not be necessary under ordinary conditions for men to stand between the cars or pans to couple.

GAS HOUSE.

- (8) Provision shall be made such that when a producer is shut off from a main pipe or when furnace is cut out, gas can not be accidentally turned on again.

CRUCIBLE PRACTICE.

- (9) A safety cable or chain shall be provided at the edge of pouring platform to prevent men engaged in pouring from falling into ladle.

SAFETY STANDARDS.

BLOOMING, BILLET, PLATE, BAR AND MECHANICALLY OPERATED MILLS.

- (1) Subways or bridges shall be provided when passageways across tables, conveyors or other mill machinery are required.
- (2) All gearing or dangerous shafting on roll tables shall be guarded.
- (3) Coupling boxes, spindles and wabblers shall be guarded.
- (4) Suitable means shall be provided for reaching the top of housings.
- (5) Guards should be placed at the dead end of all roller tables to prevent material over-riding the end of the table.
- (6) Scale tunnels shall be arranged so that scale can be removed without subjecting workmen to danger of falling hot scale, or if this is not practicable, men shall not go in pit when mill is in operation.
- (7) Wherever practicable means shall be provided to protect men working about the rolls from flying scale and cinder.
- (8) Power must be shut off pit covers while soaking pits are being repaired.

- (9) The sides of bosh tank for quenching crane dogs shall be not less than 36" above the floor level.
- (10) Counterweights must be guarded.
- (11) Means shall be provided to warn the engineer of overspeeding reversing engines.
- (12) It is recommended that straight running mill driving engines of 100 H. P. or over, be provided with a speed limit control and engine stop.
- (13) Valves, switches, and operating levers that control the movement of machinery covered by this code shall be provided with devices which will permit them to be locked.
- (14) It is recommended that all platforms, runways, aisles, doors, stairways or ladders be kept as clean as possible.

HAND OPERATED MERCHANT AND ROD MILLS.

- (1) Spindles, coupling boxes, pinions and wabblers should be guarded.
- (2) Danger from uneven or broken floor plates or gratings should be eliminated as far as possible.
- (3) Subways or bridges shall be provided when passageways across hot beds, runways, spindles or tables are required.
- (4) Adjustable guards should be provided at outside of hot beds and skids to prevent material falling off.
- (5) Hot and cold saws shall be guarded, and means be taken to reduce the number of flying sparks.
- (6) On small mills where long bars are being rolled in more than one pass at a time, safety posts should be used where practicable, to protect roll hands from being caught in the loop.

CODE OF SAFETY STANDARDS FOR PIPE MILLS.

SECTION A. — GENERAL:

- (1) These rules are intended to cover the fundamental safety requirements for lap weld mills, butt weld mills, coupling shops, galvanizing plants and all other equipment pertaining to the manufacturer of pipe.
- (2) Standard platforms, provided with permanent stairways or iron ladders should be installed, where practicable, at all elevated points where employees are daily or frequently required to go. This rule does not apply to railroad structures.
- (3) All machinery, not otherwise mentioned and covered by this code, is to be safeguarded as specified for rolling mills or in general code.

- (4) Charging and discharging openings in welding and heating furnaces should be provided with shields to protect men from heat and flames.
- (5) There should be a signal system between the charging and drawing ends of all bending and welding furnaces.
- (6) Welding and sizing machinery should be protected as prescribed for rolling mills.
- (7) Hot and cold saws shall be guarded, and means be taken to reduce the number of flying sparks.
- (8) Moving parts of threading and finishing machinery should be guarded as prescribed under general code.
- (9) A means should be provided to notify operators around the furnace when gas is to be reversed.

SECTION B. — GAS PRODUCERS:

- (1) All openings level with the ground, used for burning out gas flues, should be protected by railings or gratings when flues are being burned out.
- (2) When men are engaged in repairing gas producers or gas flues, when other producers in the same battery are in operation, suitable gates or valves shall be provided, by which all gas can be shut off.

SECTION C. — LAP WELD MILLS:

- (1) Solid welding balls should not be used, as holes for the passage of gas should be provided.
- (2) Forced ventilation should be provided for the men working in intense heat.
- (3) Space between ends of troughs, conveyors, or tables and roll stands should be barred to prevent passage.

SECTION D. — BUTT WELD MILLS:

- (1) Movable draw benches and chains should be so constructed or guarded as to protect men's feet.
- (2) Stops or guards should be provided at the delivery end of cross-roll troughs.

SECTION E. — GALVANIZING PLANTS:

- (1) Where practicable, all tanks shall be protected.
- (2) Special attention shall be given to the ventilation of galvanizing plants to remove as much of the fumes and steam as possible.
- (3) Galvanizing kettles shall be railed or shielded.

SECTION F. — COUPLING SHOP:

- (1) Shields should be provided at welding hammers and rolls to reduce the number of flying sparks.
- (2) All coupling shop machinery should have the moving parts guarded as prescribed under General Code.

SECTION G. — JOB SHOP:

- (1) All machinery used for special work in job shops should have the moving parts guarded as prescribed in the General Code.

CODE OF SAFETY STANDARDS FOR WIRE MILLS.

These rules are intended to cover the fundamental safety requirements for the wire drawing, rolling and fabricating departments of wire mills.

- (1) Standard platforms, provided with permanent stairways or iron ladders, should be installed, where practicable, at all elevated points where employees daily or frequently are required to go.
- (2) It is recommended that all platforms, runways, aisles, doors, stairways, ladders, fire escapes, or fire apparatus be kept as clean as possible.
- (3) Where practicable, all tanks or tubs should be protected.
- (4) Wire drawing, rolling and fabricating machines shall be equipped with means, conveniently located for quickly shutting down the machinery in case of emergency.
- (5) Screens or railings should be provided to protect open pot annealing furnace while being repaired or not in use.
- (6) Passageways under hot wires from annealing furnaces shall be protected.

CODE OF SAFETY STANDARDS FOR SHEET AND TIN MILLS, TINNING AND GALVANIZING.

- (1) Shearmen, openers, loaders and machine feeders, should be required to wear gloves or hand leathers, and proper protection to the fore-arm.
- (2) It is recommended that all tools, furnished either by the employer or the workmen should be kept in a condition of good repair and it is the workmen's duty to report all unsafe tools or equipment to his employer.
- (3) It is recommended employees should take proper precaution to prevent cold or wet objects coming in contact with molten metal.

- (4) Workmen shall wear eye protectors when grinding, chipping and attending galvanizing pots and tinning pots, unless other protection is provided.
- (5) Standard railings shall be provided around flywheels and drives. Cross-overs or bridges with hand rails should be provided when passage from one side of the mill to the other is necessary.
- (6) Wabblers on the end of the roll train shall be guarded, also the entering side of mill couplings when more than one roll is driven.
- (7) Shields shall be placed over furnace doors to protect workmen from heat.

CODE OF SAFETY STANDARDS FOR PUDDLING MILLS, BUSHING OR SCRAP FURNACES.

It is recommended that the following shop rules be adopted:

- (1) When furnaces are to be fired, the dampers must always be pulled up before the blast is turned on.
- (2) Before charging a furnace, the cinder on the bottom of the furnace shall be permitted to cool off until it is non-fluid.
- (3) All obstructions must be cleared off the standing before charging a furnace.
- (4) When tools are taken from the bosh, they must be dried off before placing in hot metal.
- (5) When throwing scale into the heats of hot metal, care must be taken to see that the damper of the furnace is pulled up to its full height.
- (6) After a heat of iron has been drawn from the furnace, the damper must be pulled up or adjusted to full draft before cooling off or fixing the furnace.
- (7) When throwing water into a furnace to cool off the cinder, it should be used in small quantities and extreme care taken to see that there is no bosh cinder or other solid bodies in it. At no time is any wet or damp material to be thrown into a furnace when there is melted cinder on the bottom of the furnace, when the damper is down, or the draft is shut off.
- (8) The throwing of water on balls of iron when taken out of furnaces to the hammer or squeezer is strictly forbidden.
- (9) No water shall be allowed to accumulate on the standings of furnaces, or along the mill races that the hot iron is run over to the squeezer or hammer.

- (10) In putting iron in the squeezer, great care must be exercised not to put the basket or tongs between the drum of the squeezer and the ball. In the event tongs or baskets are caught the workman must let go of same at once.
- (11) Furnaces are not to be fired without slacking the blast sufficiently to keep flames from the fire chamber burning the men working about the furnace.
- (12) Hot taps must not be placed near water.
- (13) When dumping tap buggies, care must be exercised to not allow cinder to come into contact with damp or wet ground.
- (14) Water must not be thrown on hot taps.

GENERAL.

- (1) All bloom boys and roll hands must wear goggles or copper wire face masks.
- (2) All dampers and doors on furnaces must be properly balanced and balance weight must be adjusted by the workmen and securely fastened each time.
- (3) Where switches are in use on a telephage system sufficient light must be provided by which to change switch.
- (4) When ash pits are two or more feet deep, safe and substantial means of access to and egress from pits shall be provided.
- (5) Muck mill shall be protected in accordance with rules pertaining to hand operated rolling mills.

**END OF
TITLE**